The
Cane Growers' Quarterly
—Bulletin—

VOL. X | 1 APRIL, 1947 | No. 4

Soil Fertility Trials.
RESULTS OF THE 1946 SEASON.

By L. G. VALLANCE.

AFTER a lapse of five years the Bureau has pleasure in again presenting the results of a series of fertility trials carried out mainly on growers' properties. As will be recalled the results of similar trials were a regular feature of the January issue of this Bulletin. There is no lack of evidence of the interest taken in this, and our farm trial policy has always enjoyed the full cooperation of the great majority of growers in the various districts.

The almost complete cessation of this type of experimental work for several years was, of course, a matter of dire necessity, and it was unfortunate that at the same time the impact of the grave shortage of fertilizer was suddenly thrust upon the sugar producing community. Although at the time of writing, the fertilizer position is reasonably satisfactory, except for transport difficulties, there is no doubt that the plant food content of many cane fields has been seriously depleted. It is therefore essential that adequate amounts of the correct type of mixture be applied if maximum yields are to be obtained.

The Bureau does not advocate the use of excessive amounts and the consequent wastage of this expensive material. We do not believe that fertilizer can be substituted for good farming methods or good seasonal conditions, but it is obvious that all these things will be of no avail if any one of the essential plant foods is not present in the soil in sufficient amount. For instance, let us examine the result of the fertilizer trial harvested in this series in the South Kalkie portion of the Bundaberg district. In previous years this soil type had shown practically no response to potash. However on sound principles a complete mixture was always used which contained sufficient potash to maintain a satisfactory level in the soil. With the advent of rationing the amount of potash available to this area was practically nil. As the soil reserves were used up there was a corresponding decline in yield. The results of the experiment indicate that when the relatively small amount of potash (58 lb.) was used in conjunction with sufficient nitrogen and phosphate there was a considerable increase in production, which was accompanied by an appreciable monetary gain.

Because of the possibility of the effect of fertilizer shortage persisting in many other districts in a smiliar manner, every effort is being made to return to a full scale system of soil testing by means of both fertility trials and chemical analyses.

FERTILIZER TRIALS.

Mr. L. Galea's Farm, Alexandra, Mackay.

Soil Type.—Alluvial sandy loam. **Nature of Crop.**—Plant cane.
Variety.—P.O.J. 2878. **Age of Crop.**—15 months.

RESULTS.

Fertilizer Applied per Acre.	Crop Yields.		Net Return per acre from each Plantfood Material.
	Cane per Acre.	C.C.S. in Cane.	
	Tons.	Per cent.	£ s. d.
No sulphate of ammonia	19·33	16·19	..
200 lb. sulphate of ammonia	22·77	15·88	3 9 0 Gain
400 lb. sulphate of ammonia	23·83	14·72	1 7 0 Loss
No superphosphate	21·92	14·94	..
200 lb. superphosphate	22·62	15·28	2 0 0 Gain
400 lb. superphosphate	21·32	15·88	2 6 0 Gain
No muriate of potash	21·47	14·49	..
120 lb. muriate of potash	22·56	15·16	2 16 0 Gain
240 lb. muriate of potash	21·89	15·43	1 2 0 Gain

DISCUSSION.

A most interesting feature of this trial is the effect of sulphate of ammonia on both yield and sugar content. Although the single and double dressings caused appreciable increases in the tonnage harvested, the double dressing so far decreased the sugar content of the cane that an actual loss resulted. The substantial gain in monetary return due to the application of 200 lb. of sulphate of ammonia again emphasises the value of nitrogen to plant cane.

The application of superphosphate and potash had a very beneficial effect on C.C.S. This, together with slightly increased yields, amply repaid the cost of the fertilizer, and resulted in an appreciably greater margin of profit.

Mr. J. T. Thiele's Farm, South Kalkie, Bundaberg.

Soil Type.—Reddish sandy loam. **Nature of Crop.**—Second ratoon.
Variety.—P.O.J. 2878. **Age of Crop.**—12 months.

RESULTS.

Amount of Fertilizer Used (lb. per Acre).			Cane per Acre.	C.C.S.	Net Profit to Extra Fertilizer.
Sulphate of ammonia.	Superphosphate.	Potash.	Tons.	Per cent.	£ s. d.
280	167	..	17·27	10·65	..
280	334	..	21·01	12·11	7 18 0
280	167	58	22·36	12·28	9 16 0
280	334	58	25·44	13·01	17 7 0
280	167	116	24·53	12·39	11 17 0
280	334	116	24·31	11·76	8 16 0

DISCUSSION.

This trial was designed to test the response to moderate applications of potash and somewhat larger dressings of superphosphate, all plots receiving similar amounts of sulphate of ammonia.

The figures indicate a very substantial gain from the fertilizer applications and the need for both phosphate and potash is evident under present conditions.

Unfortunately the yields from the plots receiving heavier potash applications were rendered less valuable by the low C.C.S. figures. This is rather unusual and was undoubtedly due to the severe frosting during the winter as the C.C.S. values taken at harvesting were erratic throughout.

LIME TRIALS.

The desirability of correcting any tendency towards the development of excessive acidity in sugar-cane soils has long been an established fact. Where an extreme degree of acidity has been allowed to develop unchecked, a crop failure may occur and any corrective measures may be too late to avert serious loss. Moreover, high acidity will exert an injurious effect on the physical condition and humus content of the soil which may persist for some considerable time. Under such circumstances the application of corrective methods may be a long and somewhat costly process.

During the 1946 season the plant crops from four liming trials which had been laid down the previous year were harvested. Unfortunately a similar trial in the Isis district had to be abandoned because of drought. The harvested trials were carried out on the following properties:—Messrs. C. Basso, Silkwood; M. Lauridsen, Gordonvale; R. Young, Walkerston; and G. D. R. Moir, Mount Jukes, Mackay.

Results of Lime Trials (cane, tons per acre).

District.	Silkwood.	Gordonvale.	Walkerston.	Mount Jukes.
Unlimed plots ..	23·3	18·2	20·5	13·5
Limed plots ..	24·5	20·3	22·2	15·2
Increase due to lime	1·2	2·1	1·7	1·7

The limed plots were top dressed with agricultural lime at the rate of two tons per acre just before planting. It will be seen that on these properties, the soils of which were fairly acid, an increased yield was obtained in each case by the application of lime. Although the gains were not large, ranging from 1 to 2 tons of cane per acre, they indicate the fact that the acidity of the soil was exerting a depressing effect on the growth of the cane. Furthermore, it is necessary to realise that the beneficial effect of liming should last for a number of years and therefore the amount of profit or loss cannot be determined from one year's results. These trials will now be ratooned in order to estimate the effect of the lime on the ratoons, as it is possible that in these crops it will exert its most beneficial effect.

MINOR ELEMENT TRIALS.

In addition to the well-known plant foods, nitrogen, phosphoric acid and potash, there are other substances which are also essential for the optimum growth of sugar cane. Amongst the most important of these

are such elements as copper, zinc, boron, and manganese. These are usually required only in very small quantities and when first brought under cultivation most soils usually contain sufficient amounts. Although they are referred to as "minor" elements, the term is somewhat of a misnomer, since they play a major part in the well-being of the plant. Should they be absent, or present in a form which cannot be absorbed by the plant, the growth will be markedly restricted and complete failure will often result.

Whenever there is a grave deficiency of one or more of these minor elements the cane plant usually exhibits definite symptoms which are characteristic. Spots or streaks develop on the leaves and these may be accompanied by severe stunting or other signs of abnormal growth. Fortunately, with the possible exception of small isolated cases, no cases of serious minor element deficiency have been observed in our cane fields. However, it is possible, particularly under conditions of continuous cropping, that certain soils are becoming gradually depleted in some of these important materials.

To investigate this possibility a number of experiments have been set out in the various districts. Small amounts of copper, zinc, manganese, and boron have been applied in the form of copper sulphate (bluestone), zinc sulphate, sodium biborate (borax), and manganese sulphate. These have been applied as a top dressing to both plant and ratoon crops. The rate of application varied from 15 to 20 lb. per acre of manganese sulphate, and from 20 to 25 lb. for the remainder. For convenience in applying these small amounts to the trial plots they are usually mixed with a quantity of dry soil or sand. For practical use, however, these materials could be mixed and applied with the usual fertilizer.

Three of these trials were harvested during the 1946 season, one of which was laid down at the Mackay Sugar Experiment Station on a silty loam soil, while another was set out on the red volcanic soil of the Experiment Station at Bundaberg. The third trial was located on the property of Mr. B. Anderson, Alloway, via Bundaberg, on a forest soil which may be described as a reddish brown sandy loam. All plots received the usual dressing of mixed fertilizer. The summarised results are as follows:—

Results of Minor Element Trials (Cane, tons per acre).

Treatment.	Fert. only.	Fert. + Copper.	Fert. + Zinc.	Fert. + Boron.	Fert. + Manganese.
Mackay (Plant)	27·5	26·7	26·0	26·2	27·3
Bundaberg (Plant) ..	19·4	17·6	19·0	18·7	17·6
Alloway (1st Rtn.) ..	32·6	33·0	33·2	32·5	32·0

The figures indicate that none of the trials showed a definite increase in yield due to the application of the minor elements. In the plant crop experiments at Mackay and Bundaberg the greatest yields were obtained from the use of fertilizer alone, while the differences observed in the first ratoon on the reddish sandy soil at Alloway were so small that they could not be regarded as having any significance.

The two plant crop trials will now be ratooned and the results of these, together with those of the large number of trials set out in other districts, will be of considerable interest.

The Use of Lime and Dolomite.

By L. G. Vallance.

MANY sugar growers are well aware of the beneficial effect obtained where materials containing lime or magnesia have been applied to certain types of soil. Some confusion exists, however, as to what actually happens when lime or dolomite (which is lime plus a certain amount of magnesia) is mixed with the soil and why this improvement occurs on some soil types and not on others. The effects produced by either of these two substances may be briefly summarised as follows:

(*a*) The correction of excessive soil acidity by neutralising soil acids;

(*b*) Altering the physical nature of the soil and producing a mellow, more friable condition;

(*c*) Providing lime and magnesia for use as plant food, since these two substances themselves are essential for plant growth.

Fortunately sugar cane is rather tolerant as far as soil acidity is concerned, and may be grown successfully even on soils which are too strongly acid for many other crops. However, continuous cultivation, particularly under irrigation, accelerates the loss of such acid correcting substances as lime and magnesia. Furthermore, the use of acidic fertilizers such as ammonium sulphate also tends to increase acidity and after several years continuous use soil acidity may be built up to a degree which prevents the optimum growth of the plant. Such a condition may be quickly and satisfactorily corrected by an application of lime or dolomite. If a grower is in doubt as to whether his soil needs either of these two materials for the correction of acidity, a soil test is a very useful guide. The Bureau has the facilities for carrying out this test and the grower is urged to seek advice either directly from this office or through his district Adviser in Cane Culture.

It should always be borne in mind that a high degree of acidity is particularly unfavourable for the growth of most green manure crops. It is also injurious to the minute soil organisms whose presence is essential for the conversion into humus of the ploughed-in residues of these plants. The presence of a high concentration of soil acids will prohibit the rotting of vegetable matter to such an extent that the value of green manure may be reduced to almost negligible proportions. Therefore, an occasional dressing of lime or dolomite in conjunction with a green manuring programme will considerably assist in maintaining the humus content of continuously cultivated soils. With the exception of the very sandy types, soils which are deficient in humus are usually difficult to prepare and bring to the good tilth necessary for planting.

In addition to their beneficial effects on the tilth of the soil by creating conditions favourable for the manufacture of humus, lime and dolomite also have a direct chemical effect on the clay particles which are present in all soils. These minute particles which occur in considerable proportion in the heavier soils become aggregated, i.e., large numbers of them join together forming small lumps or crumbs. When in this

condition, the soil does not set or form large clods and the drainage is considerably improved. Soils which are "sour," i.e., those of low lying areas which remain wet and practically waterlogged for long periods, have often been reclaimed by heavy dressing of lime or dolomite, providing a system of artificial drainage is put in at the same time. This drainage, of course, is necessary to carry away the water which will be freed from the soil as a result of the improvement in physical condition. Unlike an analysis for soil acidity there is, unfortunately, no chemical test which will indicate the necessity for lime as far as soil tilth is concerned. If a soil is not highly acid but is cloddy and difficult to work, a dressing of lime or dolomite will often create an appreciable improvement, particularly if green manuring is carried out in rotation with cane growing.

Lime and magnesia, as well as being soil improvers, are also, in themselves, important plant foods, and herein lies the only essential difference in the use of lime and dolomite. If a soil is deficient in magnesia, dolomite must be used since it alone contains magnesia. On the other hand, should the soil be deficient in lime, then either lime *or* dolomite could be used, since the latter contains both lime and magnesia, usually in about equal amounts. Fortunately, however, practically all Queensland soils which are suitable for sugar growing contain sufficient amounts of these two substances to supply the plants' requirements, even after being cropped for a large number of years. The amount of lime and magnesia taken up by the plant is small in relation to the actual amounts present in most soils. In general, then, the application of lime or dolomite is mainly necessary to correct soil acidity and to improve the physical condition. Since either of these materials is equally effective in these respects the question of which to use is simply a matter of which is most easily procurable, having due regard to their cost and purity.

Neutralising Value.

Lime may be purchased in several forms, all of which are suitable for agricultural purposes. Dolomite is available in one form only. The various commercial lines are as follows:

(*a*) Agricultural lime (carbonate of lime);

(*b*) Dolomite (carbonate of lime plus carbonate of magnesia);

(*c*) Burnt or quick lime (oxide of lime);

(*d*) Slaked lime (mixture of hydrated oxide and carbonate of lime).

The power of these substances to neutralise acidity is termed the "neutralising value." In order to create a standard for comparison purposes, the neutralising value of one hundred per cent. pure agricultural lime, i.e., carbonate of lime, is taken as 100. If it contains impurities, the value will be less and in order to indicate this fact to the grower the neutralising value is printed on the label attached to the bag. Supposing, for instance, a grower were able to obtain two samples of agricultural lime at the same price, one of which had a neutralising value of 90 and the other of 80, the former would be preferable, since it would take 9 tons of the latter to have the same

effect as 8 tons of the higher grade lime. This same system of evaluation may be applied to dolomite. Burnt or quick lime has a higher value than agricultural lime, whilst slaked lime is also higher, but slightly less than burnt lime. One ton of burnt lime with a neutralising value of 160 would be equivalent to 2 tons of agricultural lime or dolomite, with a value of 80. Therefore, if a grower has the choice of several sources of lime, or dolomite, a consideration of the neutralising value stated on the label, in conjunction with the price, will enable him to make the most economic purchase.

A further point to be considered in the purchase of lime or dolomite is its degree of fineness. Since these substances do not dissolve in water, it is necessary for them to be in a very fine powdery state for the maximum reaction to occur when mixed with the soil, and moreover, the speed at which this takes place is practically entirely dependent upon the fineness. Because the process of burning lime results in a very finely grained product, burnt lime has a much more rapid action than agricultural lime or dolomite. Since slaked lime is simply burnt lime which has been exposed to the air, it is also very powdery and quick-acting. In general, however, agricultural lime and dolomite are ground to a satisfactory state of fineness before being placed on the market, since it is required by law that the degree of fineness be declared on the label. As a general approximation, it may be stated that burnt or slaked lime will be effective in about a month after application, while a good agricultural lime or dolomite will require from two to three months.

When considering the application of lime or dolomite to cane soils, the amounts set out in the following table will be found to be generally satisfactory:—

Showing Requirement, in Tons per Acre, using Good Quality Agricultural Lime.

Degree of Acidity.	Sandy Soils.	Loams.	Clay Loams.
	Tons per Acre.	Tons per Acre.	Tons per Acre.
Fairly acid	1	1½	2
Strongly acid	1½	2	3

These amounts are based on the use of good quality (neutralising value approximately 100) agricultural lime. If a lime or a dolomite with a lower value is used, it would be advisable to increase the amounts applied proportionately. For instance, if the neutralising value is only 70, then approximately 30 cwts. would be required for every ton recommended in the above table. Should the grower desire to use burnt or slaked lime, in order to obtain quicker results, the rate of application per acre should be decreased according to the increased neutralising values. For instance, if the burnt or slaked lime had a neutralising value of 120 then the amounts required would be 10/12ths of the amount given in the table. Again, if the neutralising value were 160, it would only be necessary to use 10/16ths of the quantities shown above for agricultural lime or dolomite.

A Home-made Concrete Mixer.

By N. McD. Smith.

THE machine, illustrated in Figs. 94 and 95, was designed and built by Messrs. H. and G. Owens, Nambour, from parts of discarded equipment, and, except for the welding, could be constructed in any farm workshop. The finished article consists of three main parts, the frame, the hopper with bearing, and the beam and counterbalance.

The Frame.—This is made of three by three-inch hardwood, bolted with three-eighths inch bolts. Two old cultivator handles and a pair of cast off wheels are attached to facilitate transport.

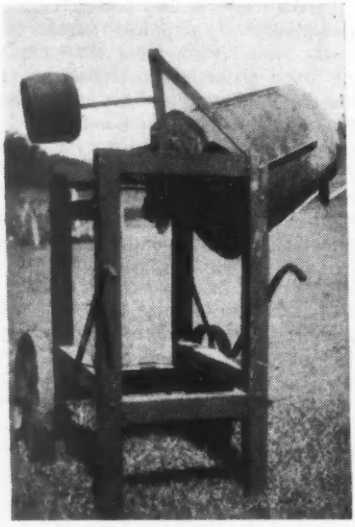

Fig. 94.—Portable home-made concrete mixer, end view.

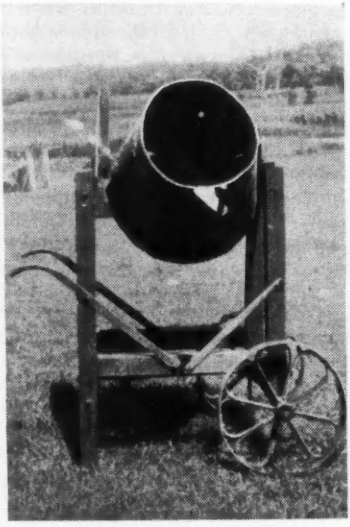

Fig. 95.—Portable home-made concrete mixer, side view.

Hopper.—This consists of an old 26-inch plough disc complete with hanger and taper roller bearings. To this has been welded a drum of 18 gauge sheet metal, tapered from the bottom to the mouth. Angle iron strengtheners have been welded to the outside, though this is not considered essential. Inside are J-shaped paddles which run the length of the hopper; it is found that this type prevents clogging of the material in the process of mixing. A handle bolted to the lip of the hopper provides the wherewithal for turning.

Beam and Counterbalance.—The beam was originally part of a side plough to which the disc and hanger also belonged. It sits on top of the frame, each end running in a simple bearing. Attached to the centre is the hanger which holds the hopper. The counterbalance is an old saucepan filled with cement and scrap iron; it is attached to the beam by an arm of one and a quarter by half inch iron. A ratchet bar with sawteeth on one side, which engages in a stop on the frame, holds the hopper in position when mixing or emptying.

The estimated capacity is two cubic feet, and the actual cost was £3 for the welding of the drum to the disc and £1 for timber. When concreting with two men it has been found that the machine operator can easily maintain a lead over the spreader. When mixing, best results were obtained if the water was added first, then the cement, followed by the gravel and sand.

The mixer illustrated stands 4 feet from the ground to the top of the framework, this height proving suitable for an ordinary sized barrow. Among advantages claimed for this contrivance are: that it is cheap, solid and durable; easy to operate because of the bearings; conveniently built and permits easy tipping into the barrow; portable and provides quick, thorough and easy mixing of concrete and finally it can be adapted for the mixing of fertilizers and fowl feed.

Trials with Emery's Ratooning Implement in Non-Irrigated Cane.

By W. J. S. Sloan.

IN the January, 1947, issue of the "Cane Growers' Quarterly Bulletin," a new ratooning implement devised by Mr. J. C. Emery, of Ayr, as an attachment to a standard grubber frame, was described. This implement has shown promise in ratooning and in handling trash under irrigated conditions and several trials have been made with it on non-irrigated ratoons in Far Northern cane growing districts.

Ratoons in districts depending on rainfall for soil moisture provide a more difficult problem. Here the ratoon stools, for the most part, are smaller than commonly found in irrigated areas and little shearing of the stools may be necessary or desirable, especially on the highlands. In country subject to grub infestation, stools are liable to be loose and easily disturbed, particularly with shallow-rooted varieties. In practice it has sometimes been found necessary to actually consolidate such loosened stools by running a rubber-tyred tractor over them. During the period of ratooning soil moisture is frequently low, and ploughing away from the stools, thus drying out the soil in their vicinity, is not advisable. Furthermore, some first ratoon stools may be left in a depression because the plant furrows may not have been completely filled in. The standard treatment of ratoons in these districts consists of discing, grubbing, and scarifying.

In operation on non-irrigated ratoon fields, the implement cut a clean furrow on each side of the stool, paring it away neatly and throwing the soil in a high mound in the centre of the interspace (Fig. 96). Mechanically the implement performed very well but general observations on several of the trials suggested that it was not suited to the type of cultivation practised in ratoon cane in the drier areas. With stunted stools or stools loosened by grub attack, shaving of the ratoons was not successful because the small stools were shifted and, in any case, could ill afford to lose much stubble. In dry soils also, the ploughed-away soil should be returned to the furrow as soon as possible

to guard against the further drying out of the soil around the stool. An adjustment to the machine may make this possible since the covering of trash in the interspace is less important at the present time than the ratooning operation, in view of the widespread practice of burning before harvest. Where the ratoons were in slight hollows, particularly on stiff clay soils, difficulty was experienced in adjusting the shear blade to cut low enough.

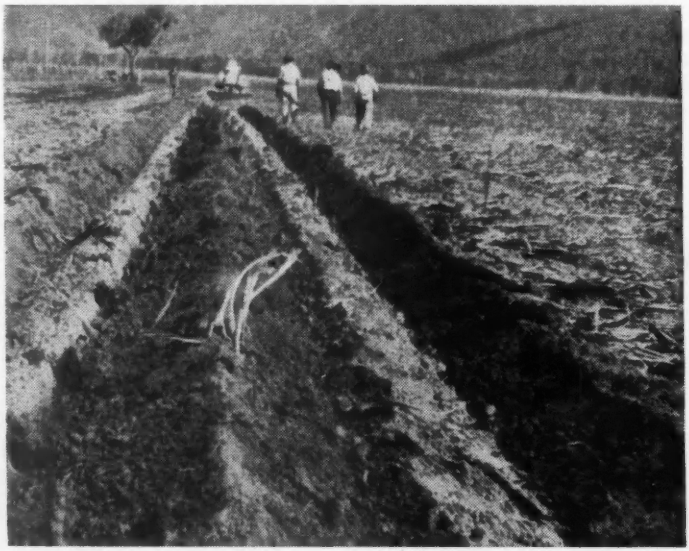

Fig. 96.—Work done by Emery's ratooning implement on non-irrigated ratoon cane.

In general, it appeared that the ratooning implement had distinct possibilities for ratooning in the wetter areas and possibly in the river flats of the drier areas, where stools are larger and satisfactory soil moisture conditions are more likely to be encountered, but in its present form, it is unlikely to be used widely for ratooning in most Far Northern canefields.

Storage of Cowpea Seed.

Stored cowpea seed may be attacked by insects, chiefly weevils, and farmers would be well advised to take precautions against the deterioration of sound seed. This may be done by treating each bushel of seed with two ounces of a dust containing 2 per cent. D.D.T. Treatment must be carried out before the seed is damaged to any extent, and it is essential that each seed should receive a uniformly fine coating of dust by thorough mixing of seed and dust. Seed treated with a D.D.T. dust can be stored in bags as this insecticide gives permanent protection against reinfestation, if the dust is efficiently applied.

—W.J.S.S.

Some Aspects of the Problem of Soil Erosion Control in Queensland Cane Fields.

By W. J. S. Sloan.

MANY of the cane growing areas of Queensland are subject to serious soil erosion. Cane is a moisture loving plant and its culture is carried on in a belt of country which is characterised by heavy to very heavy summer rainfall. Soil losses on sloping land within this belt are, consequently, often extensive. Very commonly the soil lost in erosion consists of the fertile surface layer which is higher in organic matter, nitrogen and other mineral plant foods than the underlying soil. Extra ploughings and cultivations are required to smooth out gutters and rills which form in fields, thus adding to the costs of seed bed preparation and the costs of cultivation in the growing crop. Unchecked, erosion inevitably leads to the development of uncultivable gullies and the throwing of land out of cultivation.

Fig. 97.—Showing severe erosion down to the plough sole on hillsides of a Childers cane farm. Note the abundance of cane stalks in the soil in the foreground. These were residues from the previous dead cane crop which was ploughed in.

The illustrations accompanying this article show some evidence of soil erosion which is occurring in the Isis district.

Unfortunately, this district was particularly liable to severe erosion during the summer of 1946-47, because of the unusually large acreage of land which was in bare fallow, ready for late summer and early autumn planting. This position had been created by the severe drought of 1946, which killed much standing cane and left it unfit for harvest

during the 1946 crushing season. Instead of ratooning cane so affected, many farmers, by various methods, incorporated the trash, cane stalks and stools in the soil and prepared for a new planting in 1947, thus exposing an abnormally large area to severe erosion. It is interesting to note that events have since indicated that the apparently dead stools were capable of satisfactory ratooning and that it was a mistake to plough out so many fields, when they could have been ratooned profitably at less expense than was required to prepare the land for planting.

A further cause of the widespread erosion in the Isis district was the fact that unusually heavy rains aggregating approximately ten inches in twelve hours were recorded on one day in mid-February, and then again a similar fall was experienced on 1st March, just after many fields had been worked up after the first destructive rain group. With such torrential rain and so many acres of bare loose soil exposed, heavy soil losses were inevitable.

Fig. 98.—An eroded gully in the field shown in Fig. 97.

Perhaps one of the most spectacular effects of the heavy rain is shown in Figs. 100-103. These illustrate a strong dam which was built in a gully to check loss of soil from a cultivated field by causing silting of the channel. Logs of 30 feet length and 15 inches in diameter were placed across the gully and held in position by strong supporting posts. Galvanised iron was nailed on the upstream side of the logs to prevent seepage of water and silt through cracks between the logs, while on the waterfall side a concrete slab was constructed at the base to break the fall of the water and prevent scouring. This dam appeared to be quite strong enough to resist pressure from water which was likely to collect from rainfall on the catchment area *which was only about six to seven acres in area.* Figs. 102 and 103, however, show what happened after

the heavy rainfall of mid-February, 1947, and clearly illustrate the difficulty of economically checking erosion on land with a slope greater than 10 per cent. The rush of water down this comparatively short channel (Fig. 103) was sufficiently strong to carry one of the 30 feet logs a distance of 10 chains into a neighbouring cane field and to move pieces of concrete, two hundred weight or more in weight, at least two chains downstream. In addition, most of the silt previously caught and held in the dam was scoured out.

The field comprising the catchment area was lying in a roughly ploughed state prior to the rain and contained a large quantity of ploughed-in dead cane material left over from the previous harvest, particularly along the sides of the gully where much of the standing cane was unharvested in 1946 because it died in the drought. Absorption of the early rain was good, but the loose soil later became saturated and commenced to move downwards when moving water appeared on the

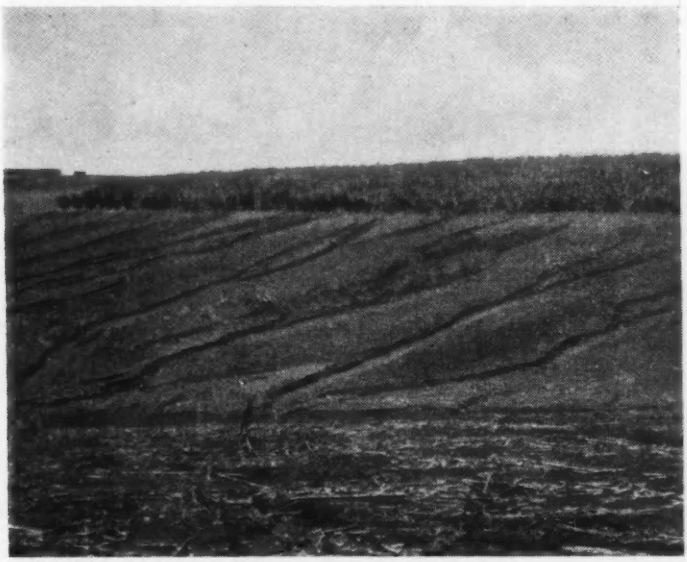

Fig. 99.—Erosion on a slope of a Childers cane field. This slope was badly eroded after the mid-February rains in 1947, was re-worked and again eroded as illustrated after the early March rains.

soil surface as the rain continued. Much soil was lost and many wide gutters were washed out in the cultivation in addition to the scouring and destruction of the dam. The former effect considerably hampered the subsequent preparation of a suitable seed bed for the autumn planting.

In terms of length of land use, Queensland cane-growing areas are still very young, and many present-day farmers are not yet fully cognisant of the dangers of soil erosion. A number of eroded soils have sufficient soil depth to permit repeated turning up of a fresh layer for cultivation and with the use of fertilizers it has been possible to continue

Fig. 100.—Photograph in winter, 1946, taken from upstream side of dam built to cause silting of gully and check soil loss in a Childers cane field. Note that silting had already commenced.

Fig. 101.—Photograph of dam shown in Fig. 100, taken from downstream side.

Fig. 102.—Photograph of dam after heavy mid-February rains in 1947, taken from upstream side, showing destruction of dam and scouring out of silt, which had accumulated previously.

Fig. 103.—Photograph of dam shown in Fig. 102, taken from downstream side. The cane shown in Figs. 100 and 101 subsequently died during the drought of 1946, and was not fit for harvest. The residues were ploughed in prior to the heavy rain.

profitable production on such land for some time, hence the tendency of many farmers to pay little heed to the menace of soil erosion. However, very few of the sloping areas can continue indefinitely with this process and ultimately land so treated will have to be abandoned for further cultivation.

Although none of the world's research stations has developed detailed methods of control for heavy rainfall areas such as the Queensland cane-growing districts, a survey of the Queensland cane belt reveals that commonsense methods could be applied in many instances to reduce soil losses. Too many farmers still plant and cultivate up and down the slopes. Fires are allowed to burn hillsides clear of vegetation and later excess water from these hillsides, unimpeded by a grass and weed cover, pours down swiftly over unprotected cultivations. Where possible grassed and graded diversion ditches should be formed to carry water away from cultivations, while any unnecessary burning of crop residues should be avoided.

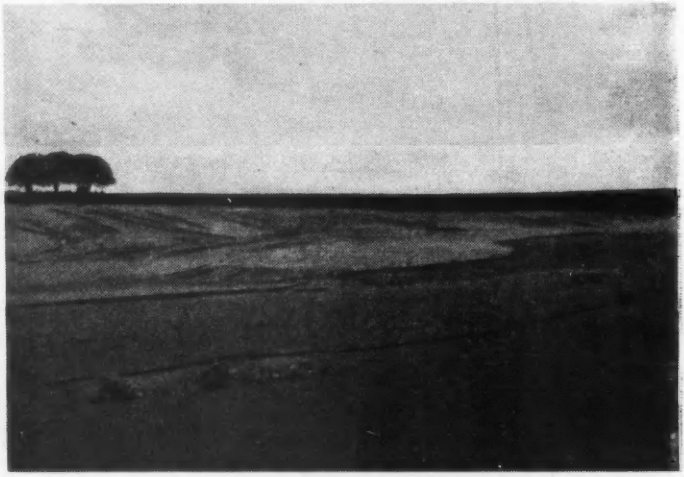

Fig. 104.—Erosion on a slope of a Childers cane field. In the foreground is a wide expanse of eroded soil deposited on a grass paddock. At the top of the hill, the land is being re-worked to fill in gutters in preparation for cane planting. Heavy rain in early March again severely eroded this area.

The problem of arresting soil erosion and deterioration in Queensland canefields is a difficult one and is not made any easier by the system of monoculture characteristic of the industry, and the erratic rainfall of the cane-growing belt. A thorough examination needs to be made of the merits of contour farming, alone and supplemented by terracing. Strip cropping on certain types of soil and slope may also have to be considered as well as grassed waterways and diversion ditches. In some areas, farming methods in use at present may also require modification. It is clear that any system which permits the exposure of uncovered fallow fields during the period of potential heavy rainfall is basically unsound and only serves to accelerate the rate of erosion. All forms of soil erosion preventive measures must be accompanied by good farming practices to achieve a full measure of success.

It is important to realize that although contour farming may materially reduce soil losses, the loss of soil with some soil types on certain slopes, even after the adoption of erosion control practices, may still be too great to maintain sustained agriculture. On most soils this seems to be particularly true where the grade of slopes is greater than 10 per cent. In other words it is highly probable that crop production on steeply sloping land subject to soil erosion will finally dwindle to an uneconomic level and the land will then be abandoned. Fortunately, cane itself is a soil-binding plant and the cane rotation requires only one seed bed preparation every four years on the average, hence this retrogression will be gradual and in some cases comparatively slow.

Overseas experience with a variety of crops other than sugar cane, particularly in the United States of America, has shown that the benefits to be gained from lands farmed according to suitable erosion practices include increased crop yields, conservation of moisture and reduction of soil losses. Furthermore, cultivation on the contour is easier and more efficient than up and down the slopes. As well as these advantages, the decreased expenditure in repairing fields also helps to offset the cost of installing erosion prevention measures. The benefits from soil erosion control practices may not be apparent immediately, especially on fields in which serious deterioration has not already occurred or in badly eroded fields where benefits may not show until a certain amount of soil building has been brought about. However, the answer to the question of whether economic gains can be achieved in Queensland cane fields will depend upon the solution of the problem of modifying and adapting known soil erosion control practices to work satisfactorily under the conditions of cane growing in areas of heavy to very heavy rainfall.

S.J.16 in the Burdekin Area.

By G. A. Christie.

THE variety S.J.16, a seedling of Badila parentage raised by the Bureau of Sugar Experiment Stations in 1921, is again becoming very popular with both growers and cutters in the Burdekin area, where vigorous growth, free trashing and generally erect habit, have been noticed in most crops (Fig. 105). Due to its strong rooting system, it shows a high degree of resistance to lodging when subjected to cyclones and floods, and less damage from cane grubs is apparent than in some other varieties under similar conditions. Sugar content is generally very satisfactory and good results have been obtained in the Burdekin area in recent years.

However, there are several undesirable features which must not be forgotten when considering the most suitable varieties for planting. S.J.16 is highly susceptible to top rot, and in areas where this disease is prevalent, losses may be rather high, especially when crop growth is checked during the spring months. It is also very susceptible to downy mildew disease and, along with several other varieties, it had to be removed from the approved list in several Burdekin mill areas some years ago and has only been returned since this disease was controlled.

S.J.16 is a slower striking cane than many standard varieties and, under adverse conditions, plants may remain in a dormant state in the soil for long periods, during which time the eyes and setts may be attacked by insects and diseases and poor strikes are the result. With any variety, it is desirable that planting should be carried out during warm weather and in soil provided with sufficient moisture, but with a variety which is naturally rather slow to germinate, particular attention should be paid to these factors.

It is generally a good, though slow ratooning variety, but cover in both young plant and ratoon cane may be poor until the crop is well established. This is a disadvantage in areas where weed and grass growth in cane fields is prolific, for frequent cultivation in small cane increases costs of production. In later growth, long and abundant foliage provides excellent cover.

Fig. 105.—A crop of S.J.16 in the Lower Burdekin.

In autumn, 1946, plantings in many parts of the Burdekin area were delayed due to labour shortages and farm repairs following the flood in March, and, as a result, a number of fields were planted during the cool months of June and July. Strikes of S.J.16 in such plantings were, in many cases, very disappointing, emphasising the fact that every effort should be made to plant the variety under favourable conditions, since the planting of "misses" is a costly and laborious job.

Irrigation Spears of the Bundaberg District.

By S. O. Skinner.

During recent years, the value of irrigation has impressed itself firmly in the minds of canegrowers in the Bundaberg district. Many growers, previously without irrigation facilities, have made strenuous efforts to locate underground water supplies and to pump the water from drifts which, in many cases, have proved difficult to manage.

In general, many of the underground drifts contain a fair percentage of fine sand and a smaller amount of clay particles. These are known as tight drifts and often present a problem in obtaining a free supply of water. In these drifts, the main type of spear used in earlier years was often found to clog.

It is therefore interesting to describe the various types of spears in use, particularly that known as the "Bag Spear" which is believed to be peculiar to this district.

The Bundaberg underground formations do not lend themselves to driving, hence the pointed spear which is designed for this purpose is little used and is mainly limited to small installations set up in places such as dry sandy creek beds.

Earlier Main Type.—This consists normally of a 4 to 6-inch casing drilled with ¾-inch holes placed at approximately 1½ inches apart from centre to centre or (as shown in Fig. 106 (*a*)), with holes in staggered rows, placed 1½ inches apart between centres around the spear and 2 inches apart along the length of the spear. A non-drilled area of approximately 3 inches is usually left at the bottom, and the open end of the spear is sealed with a welded plate.

Around the outside of the casing is spirally wound ⅛ to ¼-inch diameter wire with approximately 2 inches between turns, as shown in Fig. 106 (*a*). Over this is placed sheet or wire gauze.

The action of the spear is a direct suction of water through the gauze, through the drilled holes and up through the casing.

This type of spear is still in use, particularly in early installations where they have proved satisfactory, and in new installations where the drift is open. Its chief advantages are its free and direct intake of water through the holes in suitable drifts, and secondly it enables the use of the maximum sized spear casing in a given sized bore hole, as against the bag spear type which will be described presently.

The chief disadvantage is that of clogging in tight drifts. In fine sand and clay a gradual clogging up occurs between the gauze and the metal of the spear between the holes, aggravated by a pocketing effect from the spirally wound wire. This eventually reduces the effective area of the gauze to that immediately opposite the holes only, and with any external clogging of the gauze itself at these points, the efficiency of the spear is further reduced.

Bag Spear.—The clogging of the former spear led to efforts to design a spear which would allow the inflow of water to be evenly distributed and maintained over the whole gauze surface, and furthermore

would eliminate any impediment to flow that would otherwise promote siltation between gauze and spear casing. A leading Millaquin grower is credited with devising what is commonly termed the bag spear, which is the type most widely adopted now.

This spear consists of a 4 to 6 inch diameter casing, on the outside of which are welded four to six ribs, formed of $\frac{3}{4}$ by $\frac{1}{4}$-inch or 1 inch by $\frac{1}{4}$-inch steel on their edges. These ribs are up to some 12 feet in length and extend usually from 9 to 18 inches beyond one end of the casing. On the bottom of these extended ends is welded a steel plate. This forms the bottom end of the spear.

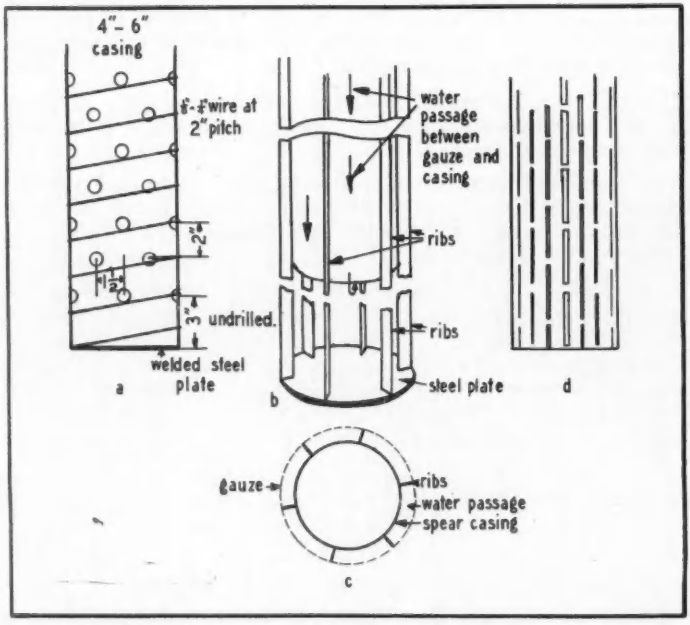

Fig. 106.—(*a*) Earlier main type of irrigation spear used at Bundaberg for pumping from underground water supplies; (*b*) showing ribs in relation to the casing in the bag spear; (*c*) a cross sectional view of the bag spear; (*d*) type of irrigation spear used without gauze showing staggering of longitudinal slots around casing.

Over the full length of the ribs is placed sheet or wire gauze. At the top of the ribs the gauze is tapered in so that it can be attached firmly to the casing, usually by the aid of a collar. The gauze is spot soldered down the ribs and firmly soldered at all joins. Fig. 106 (*b*) shows the ribs in relation to the casing, and Fig. 106 (*c*) is a cross-sectional view. Fig. 107 shows the completed spear with gauze fitted.

In operation, the water passes in through the full length of the gauze and falls vertically down to the open end of the casing. Since the channel-way between the gauze and the casing is in the vicinity of $\frac{1}{8}$ inch according to the width of ribs used, it cannot become clogged

with any fine sand and clay that passes in through the gauze. This material falls to the bottom of the bag where the turbulence of water in changing its direction is so great, that it passes up with the water to the pump outlet and does not clog.

The length of bag projecting beyond the casing is important. If made over 2 feet with a 6-inch diameter casing, silting in the bottom of the bag has been found to occur. If made under 9 inches with a 4-inch casing, it is believed that the abovementioned turbulance is so great that a restriction is placed on the desired free intake of water.

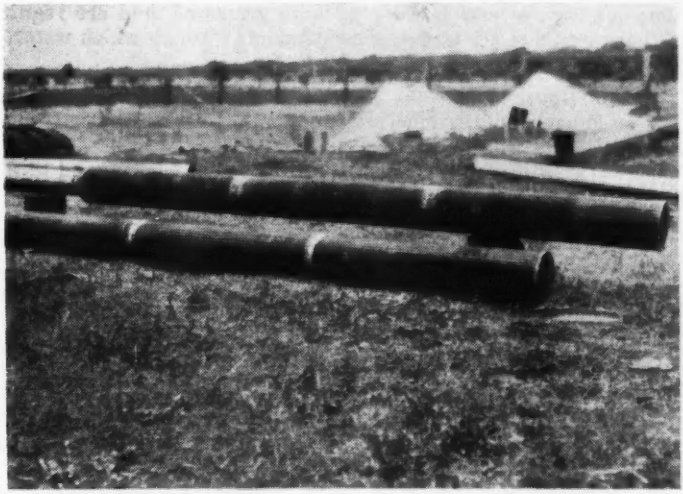

Fig. 107.—Two completed bag spears with gauze welded in position.

The size of the steel plate at the bottom is often made slightly larger than the circumference of the ribs so that in the event of "pulling" the spear, the possibility of leaving the gauze behind is minimised.

The advantages of this spear are firstly, the prevention of clogging, and secondly, the presentation of a much larger surface of gauze in relation to the size of the spear casing. Against this, however, is the disadvantage of requiring a larger, more expensive, bore hole and temporary bore hole casing to place the spear down.

Modifications of the bag spear which are employed, mainly refer to the spear casing within the gauzed area which may be drilled with a limited number of holes of up to 1 inch in diameter. This, while tending to defeat the true function of the bag, would on the other hand, in suitably graded drifts, give a freer intake of water.

Spears Without Gauze.—These spears consist simply of a perforated casing. The casing varies from 4 to 6 inches in diameter and the perforations from drilled circular holes to long narrow slits cut by an oxy-acetylene torch. In a typical drilled type, holes are of ¼ inch

diameter at ½ inch centres over a length of 20 feet, with the bottom end of the spear sealed with a welded plate. This particular spear in a good open drift has given excellent results.

With the oxy cut type, slots range in the vicinity of 3-16th inch wide by 4 inches long with ¾ inch between slots, and with the slots staggered as in Fig. 106 (*d*).

Of the two types of perforation used the slot is believed to possess the advantage of being less subject to clogging. This is based on the assumption that sand and gravel usually approximate a round shape and thus can more readily completely fill and choke a round hole. To fill the slot, however, several pebbles or large grains of sand are required, but in that case there are always some gaps left through which water can pass.

Type of Gauze Used.—As is readily appreciated, type of gauze plays a major role in the efficient functioning of any type of gauzed spear, The three main types used are firstly, copper sheet gauze with slotted holes; secondly, copper sheet gauze with round holes; and thirdly, brass wire woven gauze.

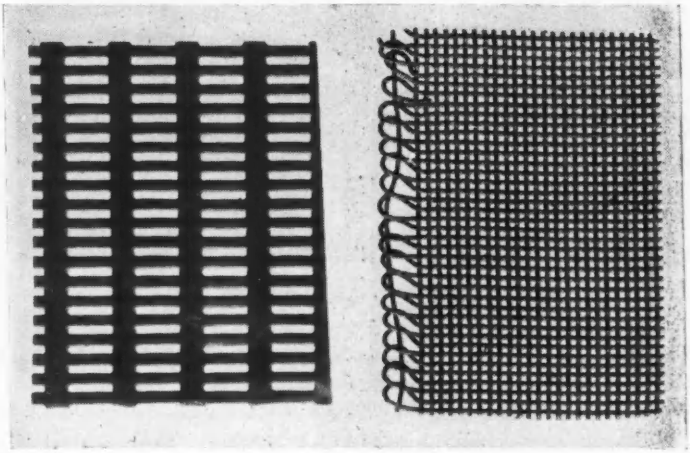

Fig. 108.—Samples of slotted gauze and woven wire gauze. (Approximately three-quarters normal size.)

Of the three, the former type appears to be the most widely sought, and in appearance is as shown in Fig. 108. The preference for slotted gauze over round holes is based on the advantages of slotted versus round holes against clogging as indicated earlier. The woven wire gauze shown in Fig. 108, while not extensively used in the past, varies greatly in size of weave from 25 to 144 holes per square inch.

The selection of gauze, however, still remains largely one of individual preference with little comparative data as a guide, and is limited at present to that which is procurable. General opinion, however, appears to be directed to the use of larger perforations that will allow a considerable percentage of sand to pass for the good development

of the spear site. There is room for thought in the findings of an overseas firm which appears to have done much work on underground supplies, that, although in the past it was considered good practice to select a size of slot that would exclude 60 per cent. to 80 per cent. of the sand, better results can be obtained with larger slots that will pass up to 60 per cent., and in some cases up to 80 per cent., except where the sand is of high uniformity.

Tractor Costs.

By C. G. Story.

HAPHAZARD methods are of no use to the farmer who wishes to make his farming systematic and efficient. Since the modern farmer employs a number of mechanical units, each of which must contribute its quota towards maintaining the general efficiency of the property, costs of production are of vital concern to him because, when related to his gross returns, they decide to a large extent the profits earned. To obtain his livelihood returns must show a reasonable margin over costs.

A considerable amount of capital is invested in farm machinery of which, on most cane farms, the tractor forms an important part. This power unit has undoubted advantages on the farm, and, since it represents a fairly large outlay, it is both profitable and interesting for the farmer to know accurately how much it actually costs him to run his tractor for any period and also what it costs to do various cultivation operations with the tractor.

Tractor costing does not require any intricate accounting. It can be made simple and straightforward and any owner can readily compute the costs for his own particular unit and conditions. An almost essential adjunct to costing is a *tractor log* in which a daily record should be kept of the following items:—Consumption of fuel, oil, and grease; hours worked; area cultivated and type of work performed. Records of the costs of fuel, oil, and repairs, and dates when costs were incurred, should also be kept in the log.

The cost of running a tractor for any period can be calculated by adding the direct costs of fuel, oil, grease, repairs, and labour to the estimated indirect costs (interest and depreciation) over the same period. Dividing this total by the number of hours worked will give the total cost of the tractor per hour. It should be noted that to determine the overall cost per acre cultivated, an allowance must also be made for interest, depreciation and maintenance of implements used, as well as labour employed. This amount should be added to the previous total before dividing by the number of acres cultivated.

Two methods of tractor costing are suggested.

1. Costing on a daily basis. This method gives immediate information.

2. Costing on an annual basis. This requires a record of all expenditure on the tractor for twelve months. Knowing the number of working days for the year, daily costs can then be computed.

METHOD 1.—DAILY COSTING.

(*Note*:—The figures used in the following table are only to illustrate the method. Each owner would, of course, substitute his own particular figures.)

Indirect Costs.

	£	s.	d.
Interest.			
Value of tractor, £500.			
Interest allowed, 4 per cent. per annum.			
Interest for the year, £20.			
Allowing 100 working days per year, the interest per working day is	0	4	0
Depreciation.			
Assumed tractor life, 6,000 working hours.			
Equivalent number of 8-hour days = 750.			
Depreciation per working day = 500 ÷ 750	0	13	4
Total indirect cost per day	0	17	4

Direct Costs.

	£	s.	d.	£	s.	d.
Maintenance.						
Allowing 3 per cent. per annum for tyres and repairs, cost for year of 100 working days would be £15; so that maintenance per working day is				0	3	0
Fuel.						
Petrol per day				0	1	3
Power kerosene, 8 gals. per day at 1/6¾ per gal.				0	12	3
Crankcase Oil.						
2 gals. S.A.E. 40 every 120 hrs. at 8s. 3d. per gal. ..	0	16	6			
1 filter element every 120 hrs. at 9s. 9d. each	0	9	9			
Total	£1	6	3			
120 hours is equivalent to 15 days, therefore daily cost is ..				0	1	9
Differential and Transmission Oil.						
5 gals. per 100 days at 8s. per gallon equals 40s. per 100 days, therefore daily cost is				0	0	5
Grease.						
10 lb. per 100 days at 10d. per lb. equals 100 pence per 100 working days, therefore daily cost is				0	0	1
Labour.						
Allow £1 per day				1	0	0
Total direct cost per day				1	18	9

Total tractor cost.

	£	s.	d.
Indirect costs per working day	0	17	4
Direct costs per working day	1	18	9
Total cost per working day of eight hours	£2	16	1

METHOD 2.—ANNUAL COSTING.

Indirect Costs.

	£ s. d.
Cost price of tractor.....	
Estimated depreciation at ..... per cent.	
Estimated interest at ..... per cent.	

Direct Costs.

Total fuel	
Total oil and grease	
Total maintenance tyres and repairs	
Total labour	
Total cost per year	£

Daily cost is total annual cost divided by number of working days per year.

SCHEDULE OF CULTIVATION COSTS.

Total tractor cost per day of eight hours is.....	
Area cultivated per day is ..... acres.	
Tractor cost per acre is	
Estimated cost per acre to cover interest, depreciation, and maintenance of implements used is	
Cost of labour per acre for cultivation	
Total cost of cultivation per acre	£

Depreciation is calculated on anticipated length of life. If 15 per cent. per annum were allowed for depreciation then a life of approximately seven years would be expected. If the tractor lasted longer than this, then depreciation costs would be reduced to nil; repair costs after seven years, however, would tend to increase. On the average, interest may be calculated with safety on 75 per cent. of the original cost because over a number of years the interest costs would decrease due to the depreciated value of the tractor. Moreover, a certain amount should be banked each year to cover depreciation, thereby reducing the "overdraft" on which interest must be paid. In general, indirect costs will vary with the interest and depreciation allowed on the tractor for the period under consideration and with the number of days or hours worked per year. Direct costs will vary with the type of tractor and skill in its operation as well as the mechanical knowledge of the driver. Good tractor management depends upon conscientious daily maintenance, prompt attention to repairs, careful driving, and the avoidance of excessive strain on the machine.

The adoption of low fuel consumption tractors with power lifts and attachable implements enables large areas to be cultivated at low cost and work to be performed rapidly and efficiently at the period when it is required. Where large areas are concerned and greater power is required the crawler tractor has its supporters. In all cases, however, the working cost of these machines plays an important part in the costs of production on the property.

Wallaby Control.*

By F. W. Reading.

THE destruction caused to cane crops by wallabies has given the Lower Burdekin Cane Pest and Disease Control Board and myself, in the capacity of the Boards' Supervisor, much food for thought. Many and varied efforts have been made to control these pests but such efforts have not met with unqualified success.

Climatic conditions in the Burdekin area, with its wet season of short duration followed by a comparatively dry winter and spring, tend to encourage the wallaby to feed on young irrigated cane after natural grasses have lost their succulent growth.

Damage to young autumn plant cane becomes apparent during the dry winter months when many tops may be eaten off. This is not considered to be very detrimental since the removal of the primary shoot normally promotes better stooling, but in many cases the plant is completely removed from the ground and complete loss of the stool results. With dry conditions continuing into the spring, damage to older cane takes the form of broken sticks, only the growing points of which are chewed. Quite large areas in a field may be affected in a short time though the damage may not be apparent from the headland.

A fair measure of control in pre-war years was exercised by organized shooting when the value of skins and scalp bonuses induced quite a number of people to take part. The attraction of the sporting aspect was also not inconsiderable.

Wartime restrictions on guns and scarcity of ammunition allowed the pest to multiply and penetrate to uncultivated lands within the area, where the growth of long, coarse grass and weeds afforded excellent cover. Burning off harbourage for the pest is not always practicable during the harvesting season, since uncontrollable fires may cause extensive damage to canefields.

Poisoned baits and snares have been found to be ineffective since treated areas seem to be avoided by the wallabies. Strychnine and arsenic, applied both dry and in solution to young cane shoots, green corn cobs, bran and pollard balls, sweet potato, pineapple, bananas, cabbage leaves, and sliced pumpkins, gave no noticeable results. Moreover, the use of poisons is not favoured by farmers because of the risk to children and farm animals.

Although the electric fencer has been suggested as a possible means of control, it is believed that it has not been used in this district.

Dogs have been used to check the activities of wallabies in the Burdekin, as well as in most other parts of Queensland. Practically every cane farmer keeps dogs of one type or another, but very few have dogs of a recognized hunting breed. The hunting breeds differ from the common farm dog in their method of working, in that a hunter will follow a scent for a considerable distance and for some time. On the other hand, non-hunting breeds will generally act only when they have the animal in sight and rarely operate beyond the boundaries of the farm.

* Paper to the Pest Boards Conference held at Tully, 29th August, 1946.

The Beagle hound was introduced into the Ayr district in 1944 in an attempt to control the wallaby pest, and now there are twelve operating in the cane area. The Beagle is a true hound, and has been a recognized breed for at least 200 years. It is not as well known as most sporting dogs, because it is not widely exhibited as a show dog, and, as far as is known at present, is being used mostly in the southern States for hare trapping, where it is considered to exercise a partial control of this pest.

Fig. 109.—Beagle hound, fine haired type.

In their working habits they seem to leave the house at 3 to 5 a.m. and return at 9 to 10 a.m., except when on a long scent in which case they have been known to remain away for two or three days. Their radius of action is usually not great, although at times the Beagle has been noticed working up to five miles away from the home. It is not known how long they will run without resting, but their endurance when on a trail through the cane paddocks, grass and weeds, and in open country is superior to most farm dogs. However, since the Beagle is a rather small dog it is desirable that it should work in company with other dogs, for when the Beagle finds the pest the larger dog ensures the killing. Alone, the Beagle may not effect a kill, but by disturbing the wallabies persistently in the early hours of the morning, when they seem to feed, damage to crops will be reduced, and the pest may be forced to migrate to pastoral areas where it is less likely to be molested by dogs.

As the wallabies are checked in a locality, the radius of effective action for the number of dogs at present in the Burdekin may become too great. Therefore, it is hoped that additional Beagle hounds will be introduced to drive the pest entirely from the cane area.

There are two types of Beagle hound, both of which are working in this area. Firstly, a type with fine hair, 14 in. to 16 in. in height, and 25 to 30 lb. in weight (Fig. 109); secondly, a dog with coarse hair, much like the Bassett hound, 16 in. to 19 in. in height, and 35 to 40 lb. in weight (Fig. 110). Colours in these types vary, including black and tan, white and pie, or lemon.

Fig. 110.—Beagle hound, coarse haired, larger type.

The Beagle hound commences working when eight to ten months old, and appears to require no special training. When the dog returns from the hunt, it may be a good practice to feed regularly with some prepared food, for this may reduce scavenging habits. As far as is known, they are not vicious towards man or child. Their stamina appears equal to the rough conditions of the work performed. Distemper and secondary distemper can be successfully treated with vaccine injections, as also can tick paralysis, but dog owners in tick infested areas already know the value of daily examinations for the presence of the dog tick.

"Gammexane" Treated Cane.

In the Cane Growers' Quarterly Bulletin for July, 1946, a picture was published showing the outstanding difference in a grub-infested block, between cane plots which had been treated with "Gammexane" (1.3 per cent. gamma isomer) and adjoining ones which were untreated. These plots were located on the Meringa Experiment Station and excited favourable comment at the time. The photograph which was printed showed the plots during the month of May; however, by the time of harvest, which was during September, the difference was much more marked. The photograph (Fig. 111) was taken on 11th September, shortly prior to harvesting the plots.

After harvesting, the ratoons of the treated plots came away better and faster than those of the untreated areas, in which large gaps appeared. A photograph of the ratoons (Fig. 112) which was taken during early February, 1947, illustrates the distinct difference between treated and untreated areas.—J. H. B.

Fig. 111.—The three well grown rows in the centre of the photograph were treated with "Gammexane" (1·3 per cent. gamma isomer) at the rate of 100 pounds per acre; untreated rows are on either side.

Fig. 112.—Ratoons from the cane shown in Fig. 111. On the right of the handkerchief are the rows of the "Gammexane" plot, on the left the untreated rows, photographed approximately four and a half months after cutting. Soil conditions were very unfavourable for good ratooning.

Modifications to the Blundell Fumigant Injector.*

By G. Wilson.

THE two most frequently occurring faults in the Blundell knapsack fumigant injector are leakage at the check valve seat and the top plunger bucket washer.

Injectors which are owned by farmers and used on a limited acreage each year may not yet be corroded or worn enough to indicate the usefulness of the modifications described below, but the injectors owned by the South Johnstone Cane Pest and Disease Control Board, which are lent successively to a number of farmers in one season and consequently come in for a large amount of work, have suffered sufficient wear to demonstrate the usefulness of the modifications.

Observations of leakage at the check valve seat pointed to small particles of metallic sulphide scale from the interior of the knapsack being a very frequent cause; the particles are caught on the leather washer of the valve seat and prevent it sealing properly. Discs of Monel metal wire gauze, 40 mesh, of 34 gauge wire, were cut with a seven-sixteenths inch wad punch and soldered across the aperture of each hose tail. The filter at the upper end of the hose is the main one in holding back scale from the knapsack. It does not become blocked up because it is continually flushed by the fumigant which rocks about in the knapsack when in use, and accumulated scale is removed from the knapsack when it is emptied or flushed out through the filler cap. The filter at the lower end functions only when the rubber peals offi the inside of the hose pipe; it is therefore not necessary to remove the hose tails to clean the filter except when the removal is necessary in any case to remedy the failure of the hose. It is possib'e that if water is used to flush out the knapsack, black sulphide dust will form a slime with the water which will make a film over the pores of the gauze. However, agitation of the fumigant should overcome this; the trouble did not occur often enough to provide opportunity to study its importance.

The reduction in leaky check valves that followed on the fitting of these filters was considerable.

When the leather washer on the top plunger bucket fails to seal properly the fumigant that leaks past is forced sharply through the vent hole in the top cap and splashes on the worker's hands and body. giving rise to much discomfort as well as waste of fumigant. Endeavours to stop this fault by replacement of the leather washer or enlarging the washer with internal packing of thin twine lead to a lot of wasted time.

To reduce the frequency of this fault as well as easing the pump operation by providing lubrication, a simple modification of the pump handle and plunger was designed which automatically supplies lubricant to the washer. The device has been in use for three years with satisfactory results. The only additional parts required are two threaded plugs of nine-sixteenths inch round brass, half an inch long.

* Paper to the Pest Boards Conference held at Tully, 29th August, 1946.

An oil reservoir was built into the "T" handle by tapping each of the horizontal arms internally with a nine-sixteenths inch S.A.E. thread and fitting into each of these a brass plug half an inch long with a slot for a screwdriver at the outer end. The thread was carried as far as practicable into each arm so that in case of blockage the plug could be screwed right in to force the lubricant through.

The plunger backstop rod was then drilled through its length with a three-sixteenths inch drill to form an oil passage. A five-sixtyfourths inch drill was then used to drill an outlet at the lower end of the plunger backstop rod. The outlet was drilled at such an angle that the upper internal end was just above and not blocked by the upper threaded end of the top plunger bucket when the parts were assembled. (The angle required was 15 degrees from the vertical). The lower, external end of the outlet was on the circumference of the enlarged lower end of the backstop rod, very close to, but not breaking, the bottom edge. Air locks are avoided by having the outlet as low as possible; but, on the other hand, if the outlet breaks the end of the backstop rod that presses on the leather washer, the sharp edge will cut a plug out of the leather when the parts are tightened and the plug may block the oil outlet.

When the pump is about to be used, one of the brass plugs in the "T" handle is removed and the hollow handle filled with heavy oil. At the first filling, the plug may be used to force the oil quickly along till some appears at the vent hole in the top cap; the handle and plunger are then rotated inside the pump tube so that the oil emerging at the outlet is smeared round the inside of the pump tube. The frequency of refilling will depend on the heat of the day and the use of the pump, varying from every half-hour to two hours. When sufficient work is contemplated to exhaust the oil the oil reservoir may be well filled up, but when nearing "knock-off" time it is advisable to allow the oil level to drop, because it is a weakness of the design that when the pump is left standing the oil continues to flow and escape through the vent hole in the top cap and runs down the outside of the pump. For that reason, and because of spillage when filling, it is necessary to have a coarse rag handy for wiping the outside of the pump. The oil does not escape in this way when the pump is working.

To overcome the loss of oil and provide further assurance of a good seal the following modification has been devised but not put into practice yet, because it entails the purchase of an additional top plunger bucket. This alteration consists of shortening the plunger rod by two inches and inserting a second top plunger bucket and washer. The upper top plunger bucket would be drilled through its length with a five-sixty-fourths inch hole and also crosswise, the two holes intersecting to form an oil outlet, instead of the small outlet in the backstop rod described above.

The oil would then fill an annular space about an inch and a half long between two leather washers. It is to be expected that the washers would block the oil from running when the pump is not working and the arrangement would form a doubly efficient seal even with a poor type of washer.

Varietal Resistance to Greyback Grubs in the Mulgrave Area.*

By P. Volp.

In the Mulgrave area, the main beetle flights over the past seven years have occurred during December and early January; therefore, one must keep in mind the fact that under normal growth conditions there is often an average of five to six feet of cane when grub damage becomes visible—late March and April. If good moisture is maintained during the next two or three months, an early harvest decreases the tonnage loss and the cane will ratoon reasonably well.

Varietal resistance to grub damage varies from year to year and is mainly governed by the type of soil and its moisture content. The effect of a light infestation in conjunction with poor soil moisture is more harmful to cane varieties than a medium infestation with good moisture on the same soil type. This difference is evident even when the current crop is cut early, and also in the resulting ratoon crop.

In the comparison of varietal damage and the assessment of resistance values of cane under average conditions of infestation and moisture, it has been noted that varieties which have a deep and vigorous rooting system are the most profitable in the ratoons, whilst those with a shallow rooting system are frequently a complete failure.

A vigorous rooter is one which has the ability to continue to make fresh roots—for example, S.J.4 and Q.44 are vigorous rooters, whilst H.Q 426 and Q.10 have weaker rooting systems. The vigorous rooter is of more commercial value, owing to its ability to retain both weight and sugar content to a greater extent than the shallow rooter.

Because of length of cane and heavy foliage, the stools of many varieties, under severe grub attack, are uprooted when the soil is moist. Here again the capacity to ratoon is dependent upon the vigour of the rooting system. A practice commonly employed by growers after harvesting grub-damaged cane is the heavy consolidation of stools by the use of rubber-wheeled tractors immediately after cutting. Varieties which respond readily to this treatment are Q.44, D.1135, P.O.J.2878, and, to a certain degree, Badila; whilst partial success only may be achieved with Q.10, Cato, Oramboo, and Comus.

Under normal moist conditions the reactions to grub damage of varieties on the approved list in the Mulgrave area may be summarized as follows:—

Badila: Has a vigorous rooting system of medium depth, but heavy foliage, and its stools uproot easily in a heavy crop; it retains C.C.S., but gradually loses weight.

Cato and Q.10: Have shallow rooting systems and medium foliage; both lodge and uproot easily, lose C.C.S. and weight, and suffer heavy loss of stools in ratoons.

* Paper to the Pest Boards Conference held at Tully, 29th August, 1946.

Korpi: Has a similar rooting system to Badila, but is less vigorous; it lodges and uproots, loses C.C.S. and weight, and suffers heavy loss of stools in ratoons.

Q.44: Has a deep, vigorous and prolific rooting system; however, it lodges and uproots easily owing to length of cane and heavy top. The stool retains life for a long period, and in consequence the cane ratoons well and responds to heavy consolidation. It holds its sugar content and weight well.

D.1135: Is a deep but sparse rooter, lodges and uproots badly, and loses weight and sugar content rapidly, but the stools respond to consolidation.

P.O.J.2878: Is a deep rooter but is more vigorous than D.1135; it lodges and uproots badly, loses weight and sugar content, but the stools retain life for a lengthy period and respond to consolidation.

Comus: Is a deep but sparse rooting variety, which lodges and uproots owing to length of cane; it retains sugar content when harvested early, but loses weight rapidly. Ratoons are fair when consolidated.

Trojan: Is a deep rooter and stands erect. It is a good ratooner, but sufficient evidence is not available to assess its value under grub-damaged conditions.

Horse Ailments.

Strangles.

By R. D. Chester, Government Veterinary Surgeon.

Australia is fortunate in so far as infectious diseases of equines are concerned because the only infectious condition of importance in Australia is the relatively benign condition known as strangles.

Strangles is caused by infection with *Streptococcus equi*, a bacterial organism which is spread easily from animal to animal, either by direct contact or by transmission on harness and other objects. For example, it can be spread by common water troughs, feed boxes, nose bags, rugs, halters, or even on the hands of the person attending the animals. One attack usually confers an immunity for life though occasionally this immunity may not operate with a more virulent strain of the disease organism.

Symptoms: The onset of strangles is usually sudden, appearing some three to ten days after the animal has been exposed to infection. The first symptoms are those of a cold; there is reduced appetite and considerable depression with a thin watery discharge from the nostril. This is followed by an increase in temperature (104 deg. to 106 deg. Fahrenheit). The membranes of the nose become inflamed and the watery discharge becomes more purulent and increases in quantity, later becoming very thick and being expelled in large quantities whenever the horse coughs. Coughing may be very frequent owing to the inflammation in the larynx and may, in fact, be induced as an early symptom by manipulation of the larynx with the fingers. The horse is usually thirsty but

finds some difficulty in drinking; water taken in through the mouth frequently returns through the nostril because the inflamed condition of the throat makes swallowing difficult.

After two or three days a marked tenderness can be noted in the submaxillary space. The lymphatic glands in this region swell markedly and abscesses form in them. These abscesses mature slowly and after two to three weeks they will break and large quantities of yellow, creamy pus come away.

In uncomplicated cases the sickness runs a course of from two to four weeks. Later, when the submaxillary abscesses drain, the fever drops and the appetite returns.

Though complications are not common, care must be exercised to prevent them. Glands other than those in the submaxillary space may be affected. In such cases respiration may be seriously interfered with and early surgical treatment is necessary.

Should an internal abscess break and the pus be carried into the blood stream a fatal septicaemia (blood poisoning) may result because abscess formation in the region of the lung may lead to a secondary pneumonia which is often fatal.

Prevention and Cure: In order to avoid infection everything possible should be done to keep healthy horses isolated from those carrying infection. Should an outbreak occur in a district all horses should be treated with strangles vaccine. This vaccine has certain deficiencies, but its use during an outbreak is of great value and there must be no hesitation in vaccinating all horses as quickly as possible.

Sick horses must be given complete rest; they should have constant access to fresh, clean water and should be tempted with small amounts of laxative food, either green feed or hot bran mashes.

All abscesses should be lanced and properly drained immediately they show a tendency to "break."

Considerable relief can be given by aiding the discharge of secretion from the respiratory passages. This is most easily done by medicated vapours. Place a quart tin of bran in a nose bag, mix in one or two teaspoonfuls of eucalyptus and add boiling water. The vapour given off can be run up through a bag funnel to the horse's head so that he inhales it, or in less nervous horses the base bag can be fitted directly onto the head. After the first treatment, horses will submit to this willingly. Steam for 10 to 15 minutes three times a day.

An electuary of one ounce each of potassium chlorate and belladonna in one pound of treacle will relieve the congestion if smeared on the tongue in small quantities at frequent intervals.

In severe outbreaks therapy with sulphanilamide should be considered as some cases which will not respond to the general treatment described will benefit if sulphanilamide is administered at the rate of two to three ounces for the first dose, followed by one ounce twice a day for four or five days.

The mortality rate from strangles is not great but in order to avoid secondary complications and the possibility of permanent damage to the wind, every care and precaution should be taken with horses immediately an outbreak occurs.

A. H. Tucker, Government Printer, Brisbane.